


Test Report No.:		13022201.fcc01		Page 1 of 45	
Client:	N.V. Nederlandsche Apparatenfabriek "Nedap" Parallelweg 2, 7141 DC Groenlo Netherlands				
Test Item:	Spread Spectrum Transmitter (DSS) UHF EPC Gen2 RFID Reader				
Identification:	UPASS Access	Serial No.:	D306-0003 and D306-0004		
Project No.:	13022201	Date of Receipt:	2013-03-07		
Testing Location:	TÜV Rheinland EPS B.V. Eiberkamp 10 9351VT Leek				
Test Specification:	FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-12 Edition) RSS-Gen (issue 3, December 2010) an RSS-210 (Issue 8, December 2010) ANSI C63.10: 2009				
Test Result:	The test item passed the test specification(s).				
Testing Laboratory:	TÜV Rheinland EPS B.V. Eiberkamp 10 9351 VT Leek				
Tested by:			Reviewed by:		
2013-04-03	R. van der Meer / Inspector	2013-04-03		O. Hoekstra / Reviewer	
Date	Name/Position	Signature	Date	Name/Position	Signature
Other Aspects: N/A					
Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable NT = not tested					
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TEST SUMMARY

5.1.1 CONDUCTED OUTPUT POWER

RESULT: PASS

5.1.2 20dB BANDWIDTH

RESULT: PASS

5.1.3 CONDUCTED SPURIOUS EMISSION

RESULT: PASS

5.1.4 Radiated spurious emissions of the receiver

RESULT: PASS

5.1.5 BAND EDGE CONDUCTED EMISSIONS

RESULT: Pass

5.1.6 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER

RESULT: PASS

5.2 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER

RESULT: PASS

6 Number of hopping channels, Carrier frequency separation, Average time of occupancy

RESULT: PASS

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1. General Remarks

1.1 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 120VAC/60Hz
Air pressure	: 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Antenna Port Conducted Emission					
Spectrum Analyzer	Rohde & Schwarz	FSV	99733	05/2012	05/2013
Temperature-Humiditymeter	Extech	SD500	99857	02/2013	02/2014
For Radiated Emission					
Measurement Receiver	Rohde & Schwarz	ESCI	99699	03-29/2012	03-29/2013
RF Cable S-AR	Gigalink	APG0500	99858	02/2013	02/2014
Controller	Heinrich Deisel	4630-100	99107	N/A	N/A
Test facility	Comtest	FCC listed: 90828	99580	02/2012	02/2015
Spectrum Analyzer	Rohde & Schwarz	FSV	99733	05/2012	05/2013
Controller	EMCS	DOC202	99608	N/A	N/A
Antenna mast	EMCS	AP-4702C	99609	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	99855	02/2013	02/2014
Guidehorn 1-18 GHz	EMCO	3115	12484	04/2012	04/2013
Guidehorn 18-26.5 GHz	EMCO	RA42-K-F-4B-C	12488	04/2012	04/2013
Biconilog Testantenna	Chase	CBL 6111B	15633	01/2013	01/2014
2.4 GHz bandreject filter	BSC	XN-1783	14450	N/A	N/A
Bandpass filter 4-10 GHz	Reactel	7AS-7G-6G-511	99076	N/A	N/A
Bandpass filter 10-26 GHz	Reactel	9HS-10G/26.5G-S11	99136	N/A	N/A
Preamplifier 0.5 - 18 GHz	Miteq	AMF-5D-005180-28-13p	99596	N/A	N/A
For AC Line Conducted Emission					
Measurement Receiver	Rohde & Schwarz	ESCS30	15667	10-2012	10-2013
LISN	EMCO	3625/2	12512	01/2012	01/2014
Pulse limiter	R&S	ESH3-Z2	13313	01/2013	01/2014
Shielded room for Conducted emissions	--	--	99858	--	--
Variac 250V 6A	RFT	LTS006	99161	--	--

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

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2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.5dB
	> 1GHz	±0.7dB
AC Line Conducted emissions	150kHz - 30MHz	±3.5dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.0dB
	> 1GHz	±5.5dB

3. General Product Information

3.1 Product Function and Intended Use

The brand Nedap model uPass Access, hereafter referred to as EUT, is a Spread Spectrum Transmitter (DSS) intended to be used in a building access system. uPass Access is a compact UHF EPC Gen2 RFID reader and is factory configured for the 902-928 MHz band. The uPass Access system reads passive transponders and the read range is maximum 2 meters (6 feet). The device is supplied by a DC voltage in the range of 12-24 Vdc.

The EUT is intended for vertical mount position and all tests are performed with the EUT in this position.

The content of this report and measurement results have not been changed other than the way of presenting the data.

3.2 System Details

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Spread Spectrum Transmitter (DSS)
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	uPass Access
Serial number	:	D306 – 0003 (used for radiated tests) and D306 – 0004 (used for conducted tests)
Voltage input rating	:	12 – 24 Vdc
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	2 Integral antennas, 1 for horizontal polarization and 1 for vertical polarization, declared antenna gain 2.0 dBi. Not used simultaneously.
Operating frequency	:	902-928 MHz
Modulation	:	GFSK
Spreading technique	:	FHSS
Remarks	:	n.a.

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Table 3: Interfaces present on the EUT

There is a RS-485 and an USB interface present on the EUT.
The USB interface is for servicing purposes only.

No.	Port	From	To	Remarks
1.	Mains	Mains	Laptop (AUX1)	Through a AC/DC power supply
2.	Mains	Mains	AUX2	--
3.	Data com.	Laptop USB	AUX3	--
4.	Communication	EUT	AUX3	--

3.3 Clock Frequencies

The highest clock frequency generated by the EUT is 20.000 MHz.

3.4 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 and RSS-Gen and RSS-210.

The test methods, which have been used, are based on ANSI C63.10: 2009.

During pretests no significant differences were observed in testresults while varying supply voltage from 85% to 115%.

For details, see under each test item.

4.2 Operation Modes

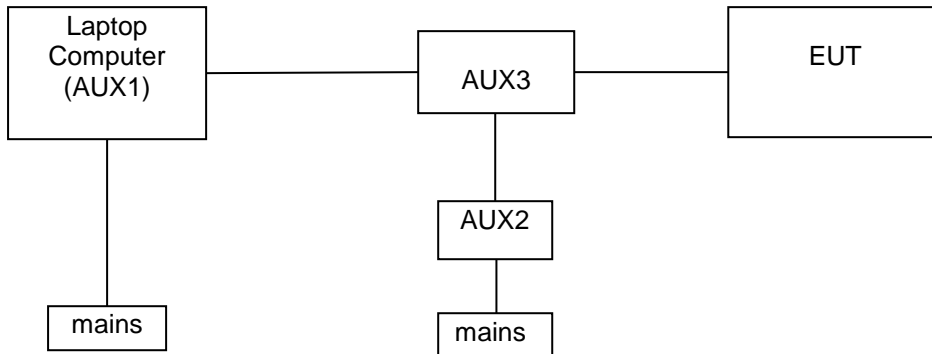
Testing was performed at the lowest operating frequency (902.7), at the operating frequency in the middle of the specified frequency band (915.2 MHz) and at the highest operating frequency (927.2 MHz).

4.3 Physical Configuration for Testing

The EUT was tested on a stand-alone basis and only tested in vertical position (it's intentional position) on a cellular concrete support and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10:2009.

Figure 1: Test Setup Diagram



Notes:

For antenna conducted measurements, the antenna was replaced by a 50Ω antenna connector.
For more details, refer to the document: Test Set-Up Photographs document.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing: Nedap AVI UHF Tool.

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.

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4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. AUX1
Product: Laptop Computer
Brand: HP
Model: Compaq 610
Serial Number: CNU94710W B
Remark: property TR-EPS, host for testsoftware

2. AUX2
Product: AC Power Adapter
Brand: Power-WIN Technology Corp.
Model: PW-024A-1Y240K
Output Voltage: 24 Vdc
Remarks: connects to AUX3

3. AUX3
Product: Communication interface
Manufacturer: --
Brand: --
Rated Voltage: 24Vdc
Remarks: communication interface between EUT and AUX1

5. Test Results

5.1 Conducted and Radiated Measurements

5.1.1 Conducted Output Power

RESULT: Pass

Date of testing:

2013-03-07 / 2013-03-11

Requirements:

FCC 15.247(b)(2) and RSS-210 Section A8.4 (1)

For systems using frequency hopping in the 902-928 MHz band, the maximum peak output power is 1W (+30dBm) for systems employing at least 50 hopping channels.

Test procedure:

ANSI C63.10: 2009.

The Peak Conducted Output Power was measured using the method stated in section 6.10.1 in ANSI C63.10: 2009.

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables. EUT never sends on both antenna's simultaneously.

Table 4: Conducted Output Power

Frequency [MHz]	Output Power Vertical Polarisation [dBm]	Output Power Horizontal Polarisation [dBm]	Output Power Vertical Polarisation [mW]	Output Power Horizontal Polarisation [mW]	Limit [dBm]	Limit [mW]	Result
902.7	28.23	26.98	665.3	498.9	+30	1000	Pass
915.2	28.06	26.82	639.7	480.8	+30	1000	Pass
927.2	27.87	26.77	612.4	475.3	+30	1000	Pass

Notes: $mW = 10^{(dBm/10)}$
 $dBm = 10 \times \log(mW)$

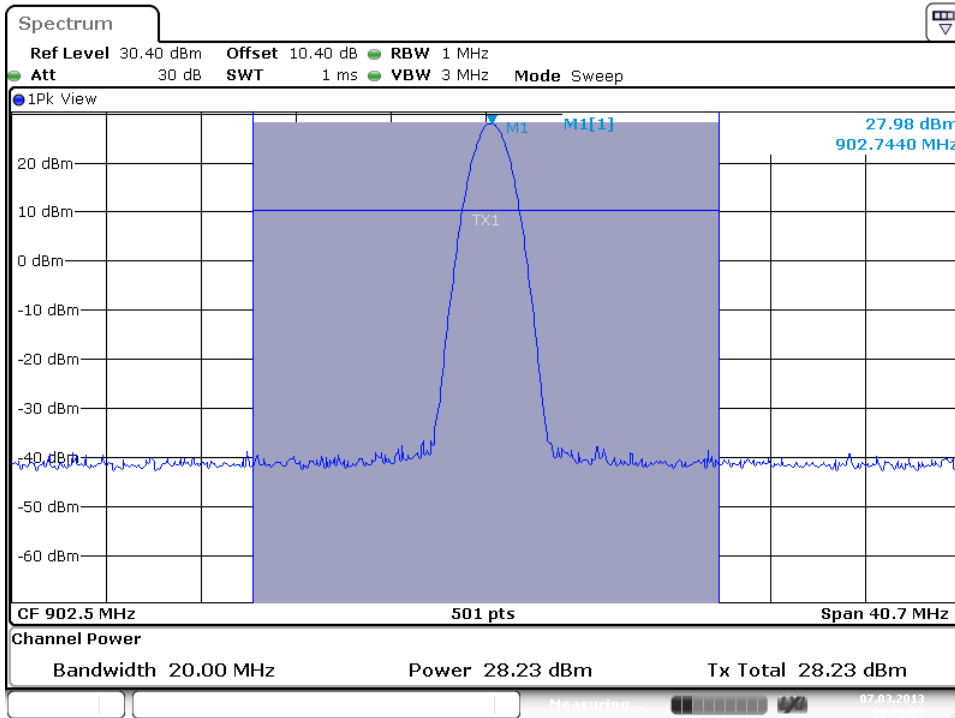
plots : Peak power plots,

Figures 1a, 1b and 1c show plots of the Peak Power outputs, correction factors included in the reading.

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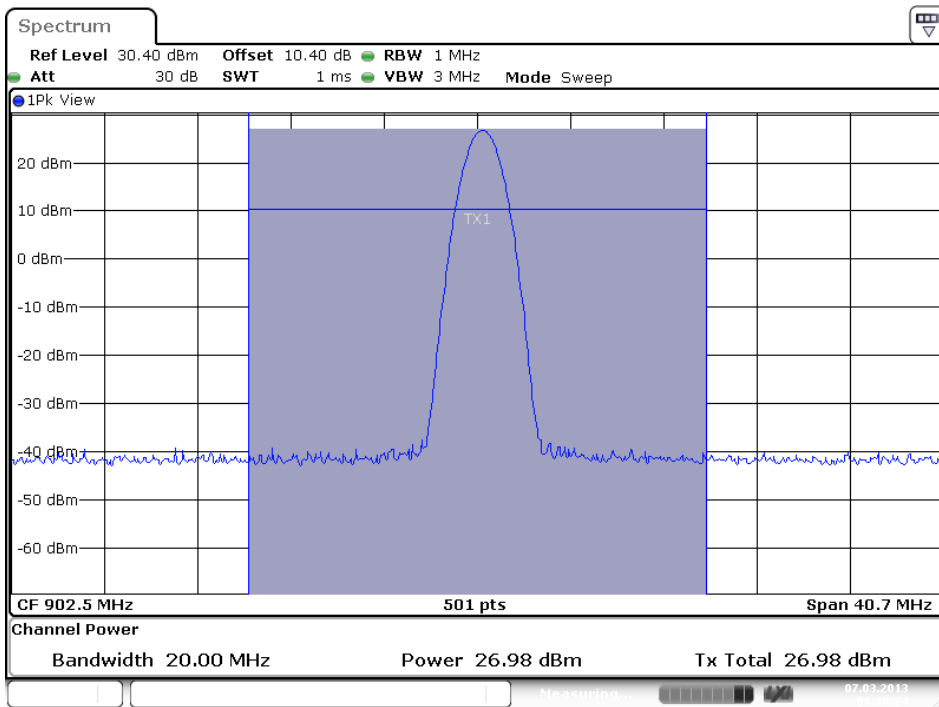
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Date: 7.MAR.2013 09:23:07

Plot: Output Power Vertical Polarization (902.7 MHz)



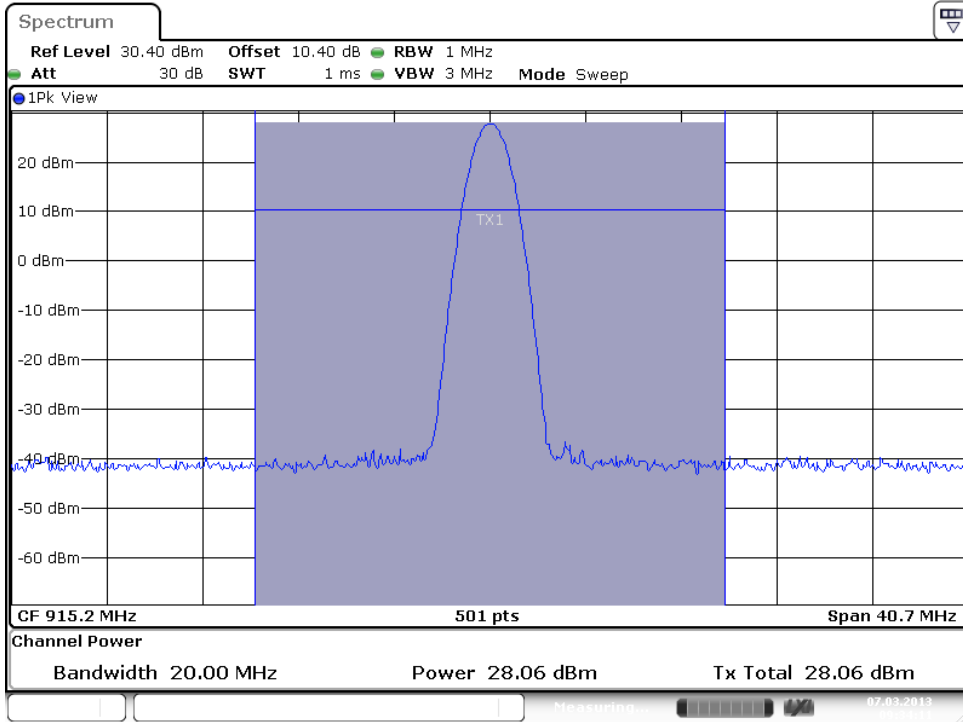
Date: 7.MAR.2013 09:28:24

Plot: Output Power Horizontal Polarization (902.7 MHz)

Test Report No.:

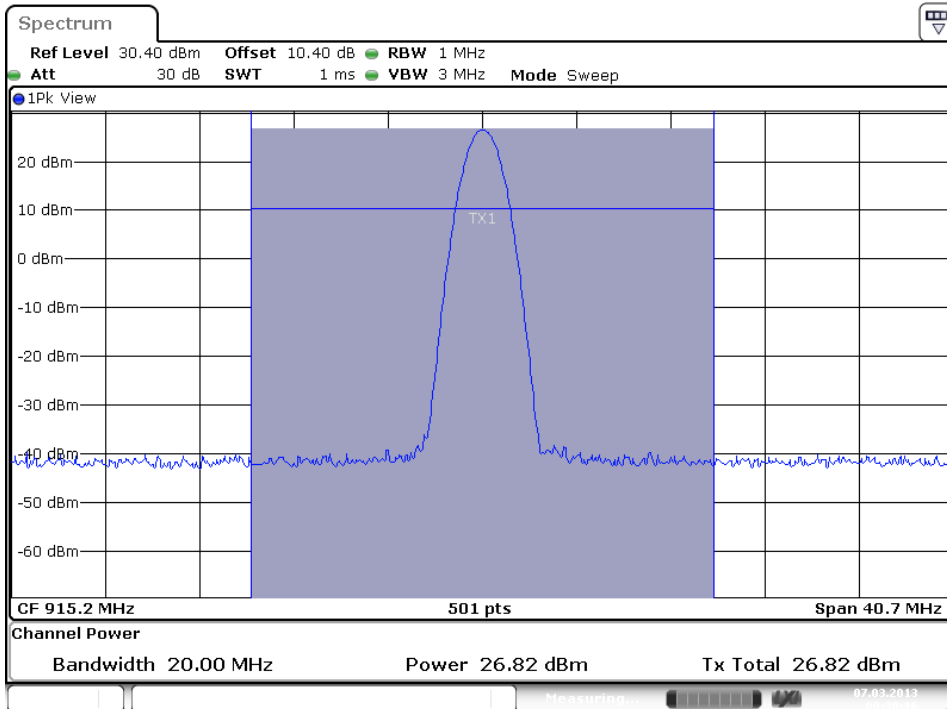
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Date: 7.MAR.2013 09:34:11

Plot: Output Power Vertical Polarization (915.2 MHz)



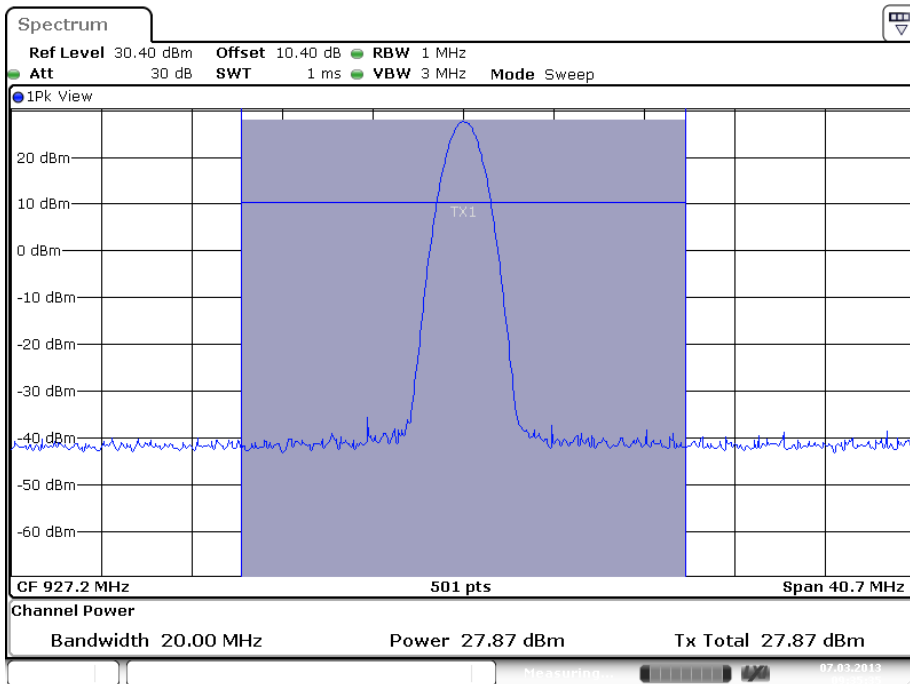
Date: 7.MAR.2013 09:30:16

Plot: Output Power Horizontal Polarization (915.2 MHz)

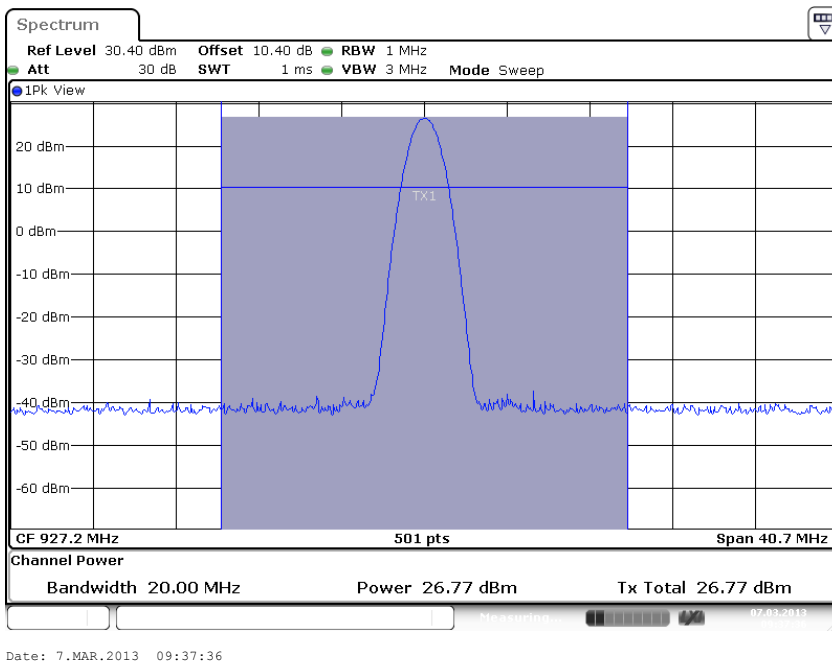
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Plot: Output Power Vertical Polarization (927.2 MHz)



Plot: Output Power Horizontal Polarization (927.2 MHz)

Figure 3: Peak power plots,
plots of the Peak Power outputs, correction factors included in the reading.

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5.1.2 20dB Bandwidth

RESULT: Pass

Date of testing:

2013-03-20

Requirements:

FCC 15.247(a)(1)(i) and RSS-210 Section A8.1(c).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall have at least have 50 hopping channels and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 10kHz and the span between 2 – 5 times the emission bandwidth.

Note: 99% bandwidth is provided for info.

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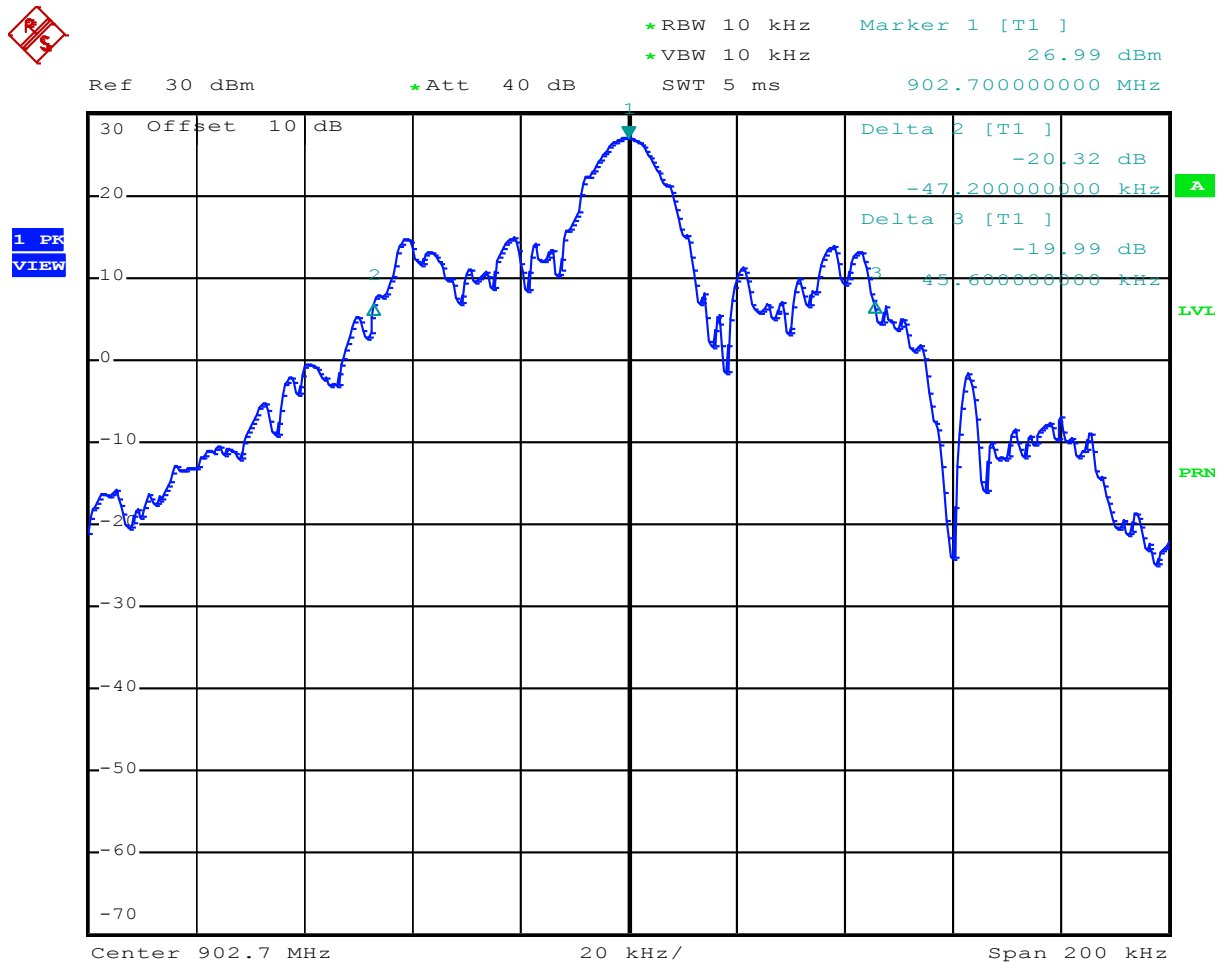
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Table 5: 20dB Bandwidth

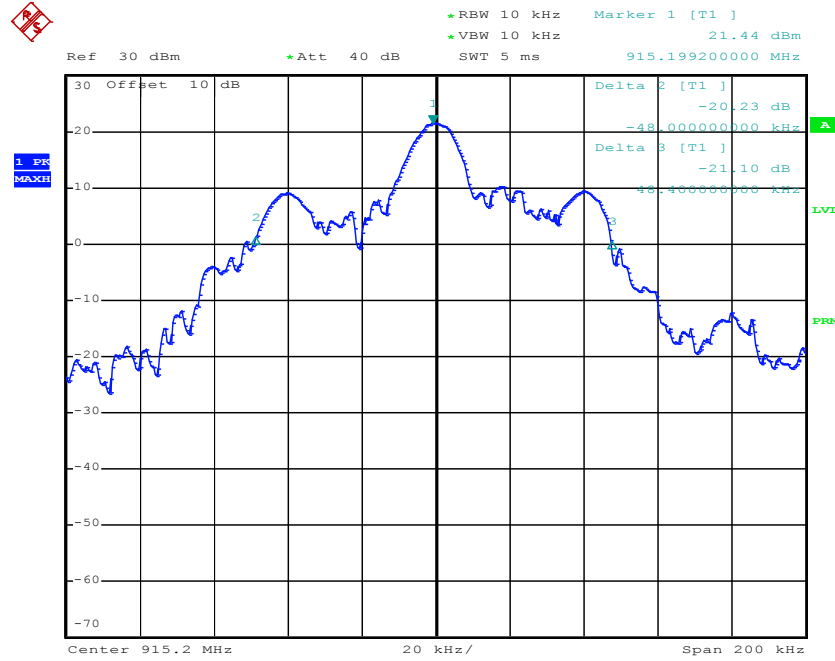
Operating Frequency [MHz]	20dB Bandwidth [kHz]	Limit [kHz]
902.7	92.8	<500
915.2	96.4	<500
927.2	96.8	<500

Figure 4: 20dB Bandwidth, 902.7 MHz



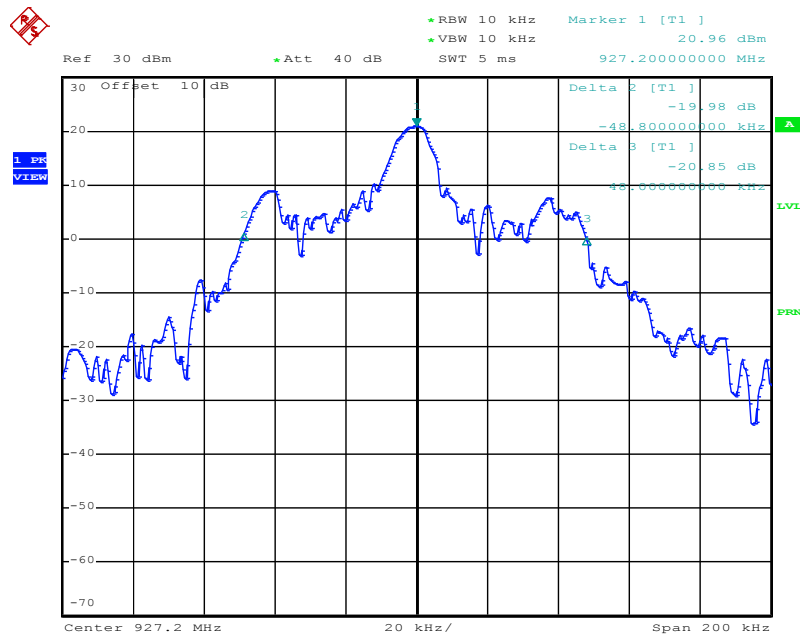
Date: 20.MAR.2013 16:13:43

Figure 5: 20dB Bandwidth, 915.2 MHz



Date: 20.MAR.2013 16:08:22

Figure 6: 20dB Bandwidth, 927.2 MHz



Date: 20.MAR.2013 16:17:48

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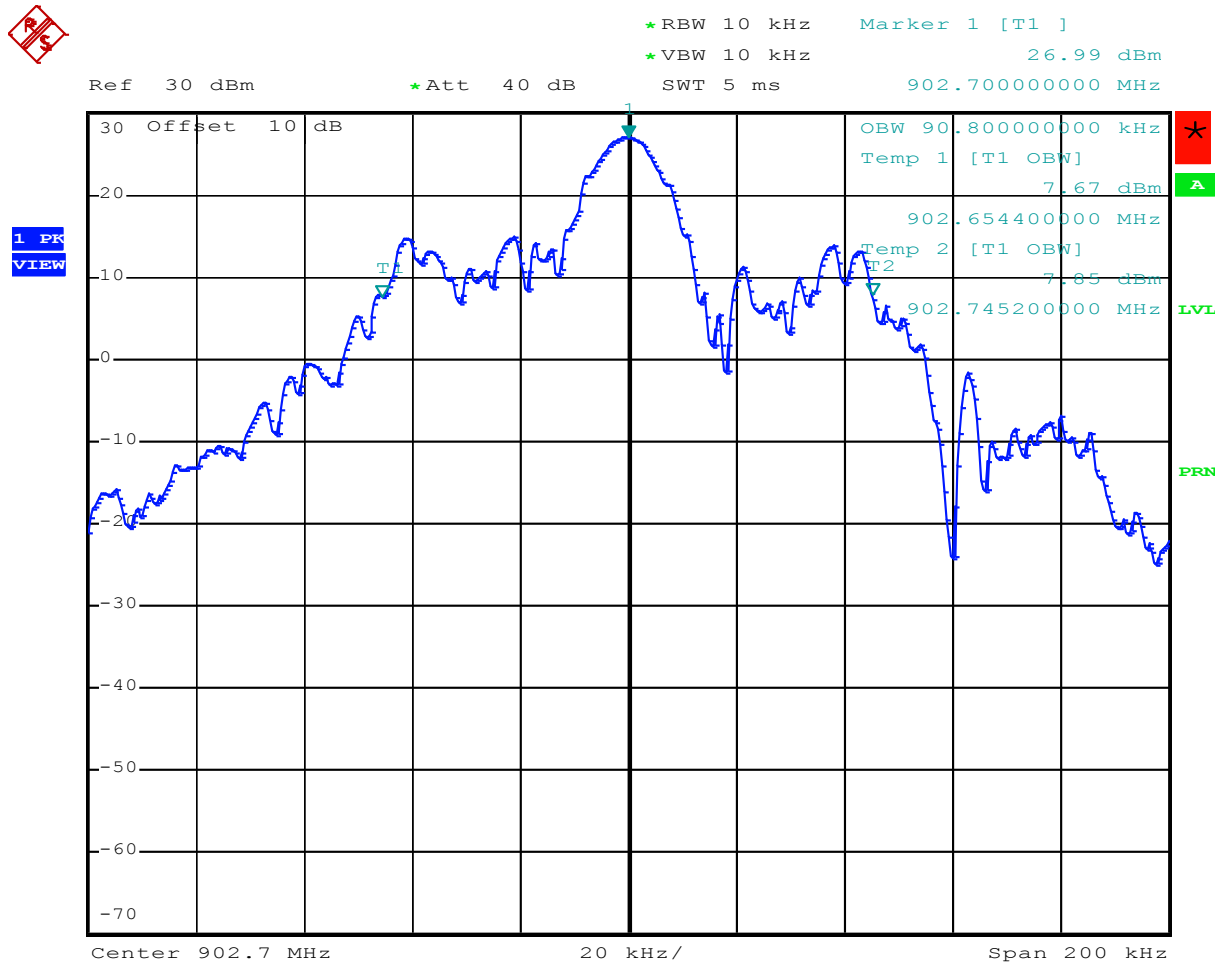
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Table 6: 99% Bandwidth

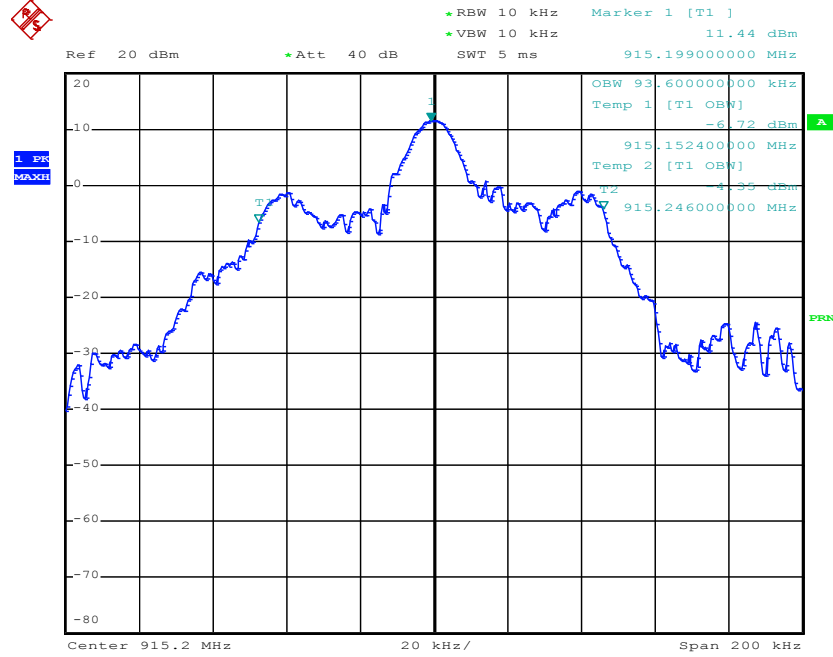
Operating Frequency [MHz]	99% Bandwidth [kHz]	Limit [kHz]
902.7	90.80	<500
915.2	93.60	<500
927.2	92.80	<500

Figure 7: 99% Bandwidth, 902.7 MHz



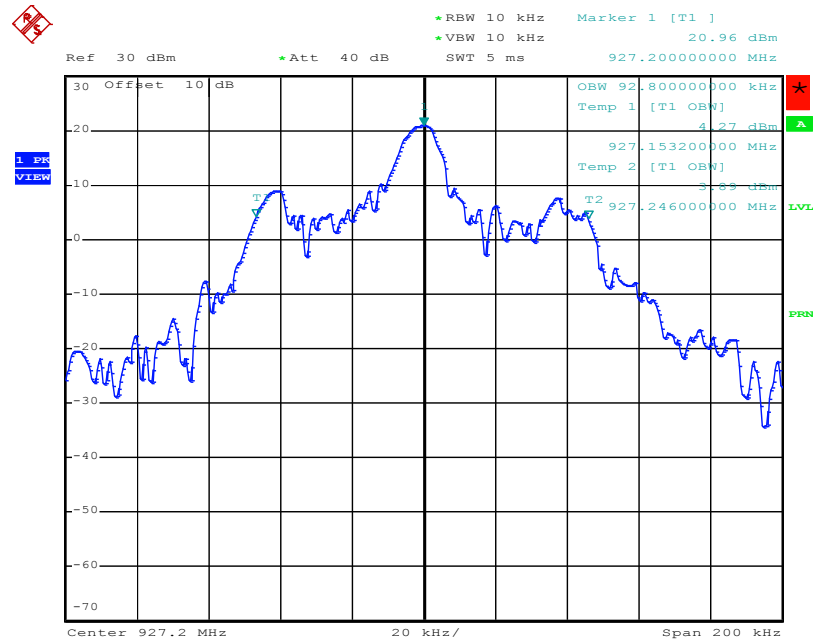
Date: 20.MAR.2013 16:14:35

Figure 8: 99% Bandwidth, 915.2 MHz



Date: 20.MAR.2013 16:02:45

Figure 9: 99% Bandwidth, 927.2 MHz



Date: 20.MAR.2013 16:18:25

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5.1.3 Conducted Spurious Emission

RESULT: Pass

Date of testing: 2013-03-21

Requirements:

FCC 15.247(d) and RSS-210 Section A8.5.

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

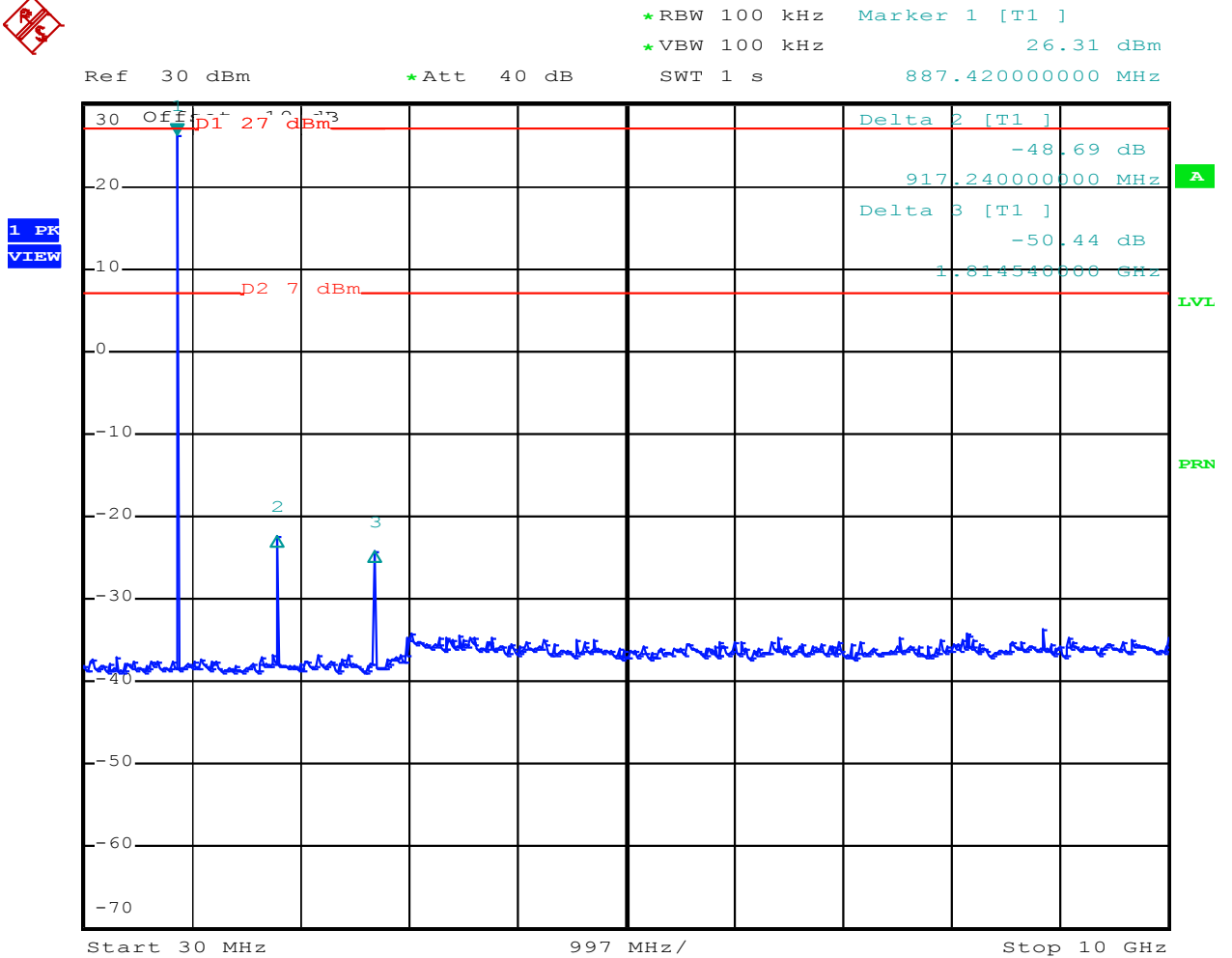
Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30MHz to 10GHz (10th harmonics).

The final measurement takes into account the loss generated by all the involved cables.

Figure 10: Conducted Spurious Emission, 30MHz - 10GHz, 902.7 MHz



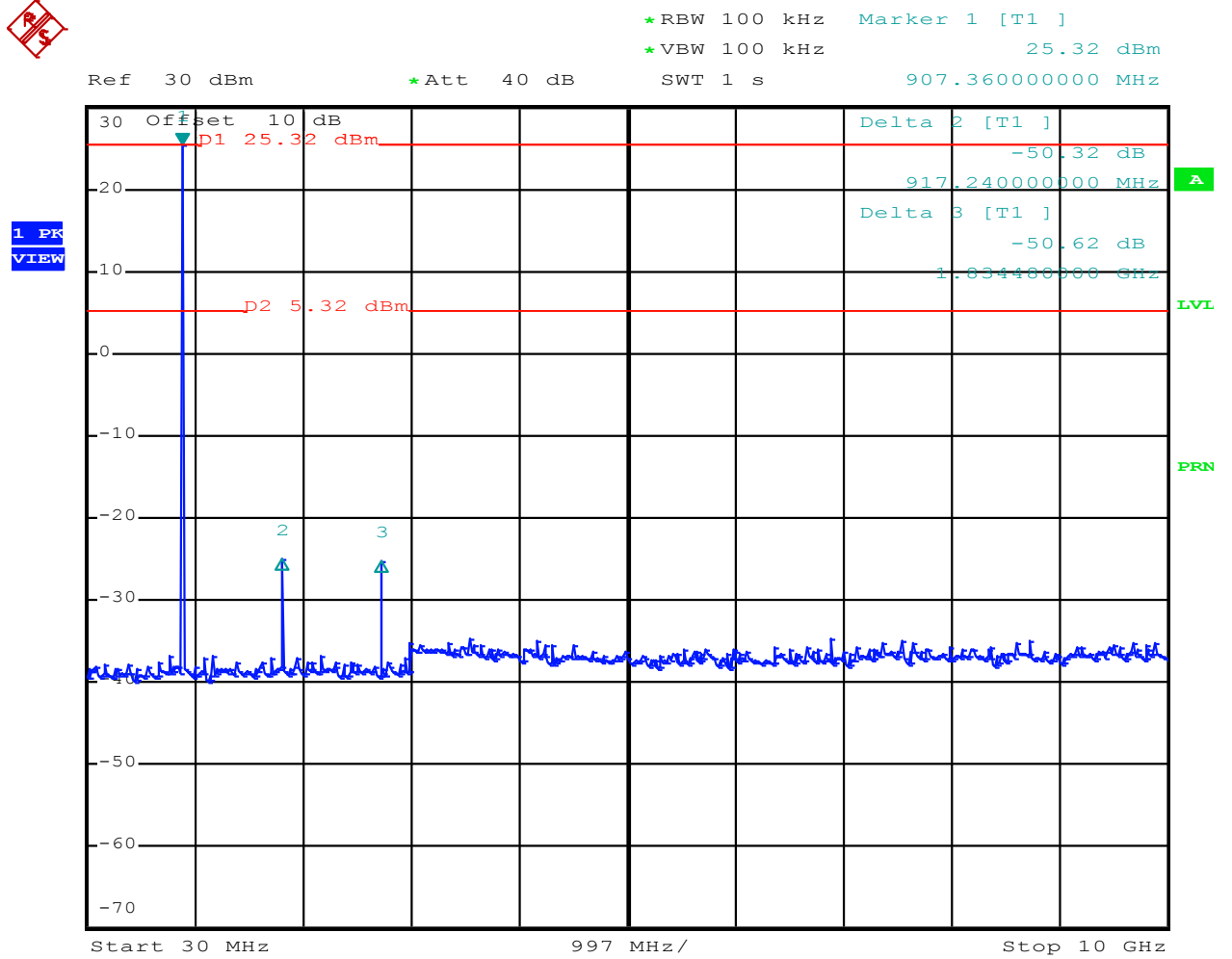
Date: 21.MAR.2013 08:19:45

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Figure 11: Conducted Spurious Emission, 30MHz - 10GHz, 915.2 MHz



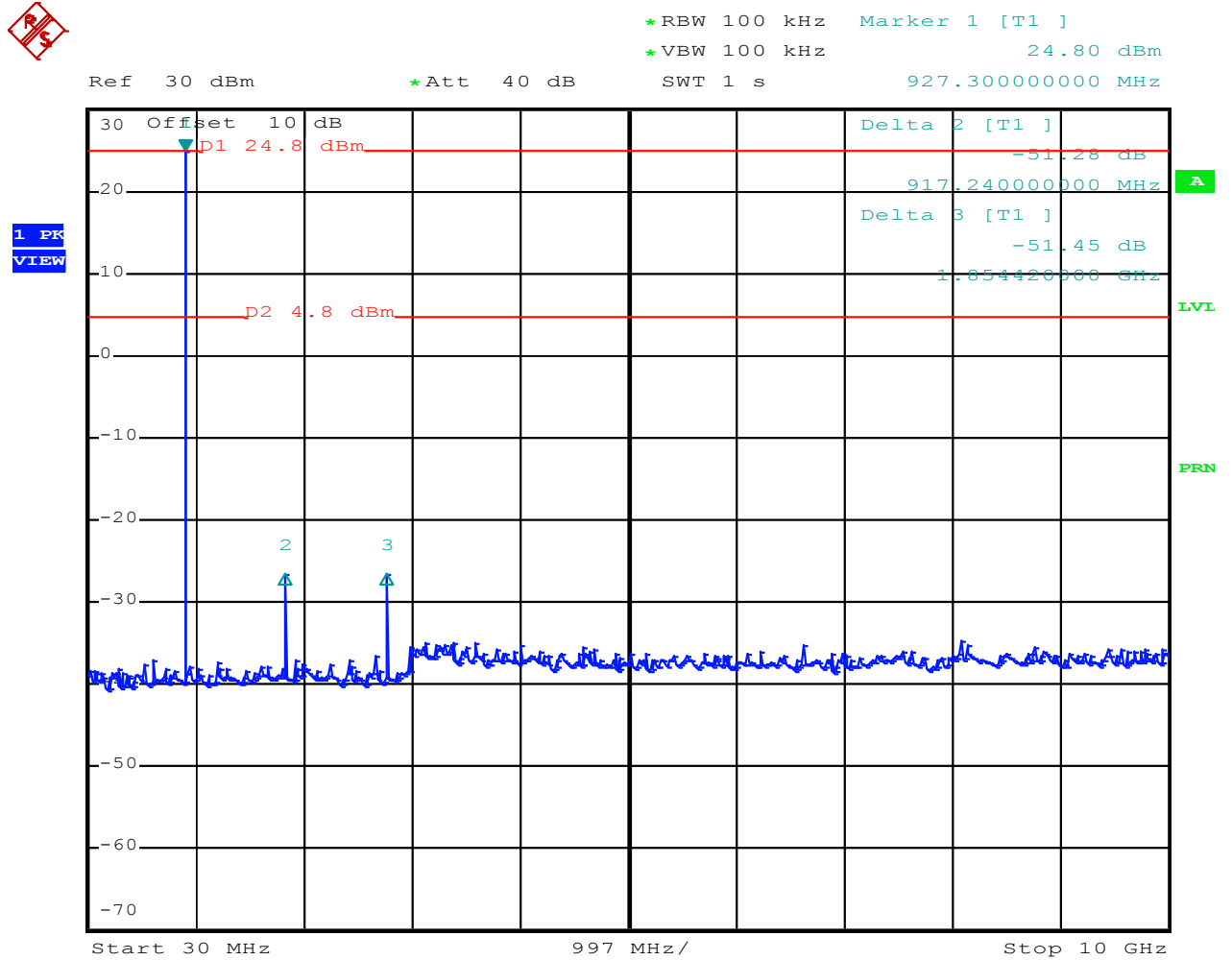
Date: 21.MAR.2013 08:21:57

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Figure 12: Conducted Spurious Emission, 30MHz - 10GHz, 927.2 MHz



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5.1.4 Radiated Spurious Emissions of the receiver.

RESULT: Pass

Date of testing:

2013-03-07

Requirements: RSS-Gen Section 6.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table below.

Frequency (MHz)	Detector	Bandwidth (kHz)	Fieldstrenght ($\mu\text{V}/\text{m}$ at 3m)	Fieldstrenght ($\text{dB}\mu\text{V}/\text{m}$ at 3m)
30-88	Quasi Peak	120	100	40
88-216	Quasi Peak	120	150	43.5
216-960	Quasi Peak	120	200	46
>960	Average	1000	500	54

Test procedure:

RSS-Gen 4.10: The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

Results:

See the following page.

The final measurement takes into account the loss generated by all the involved cables.

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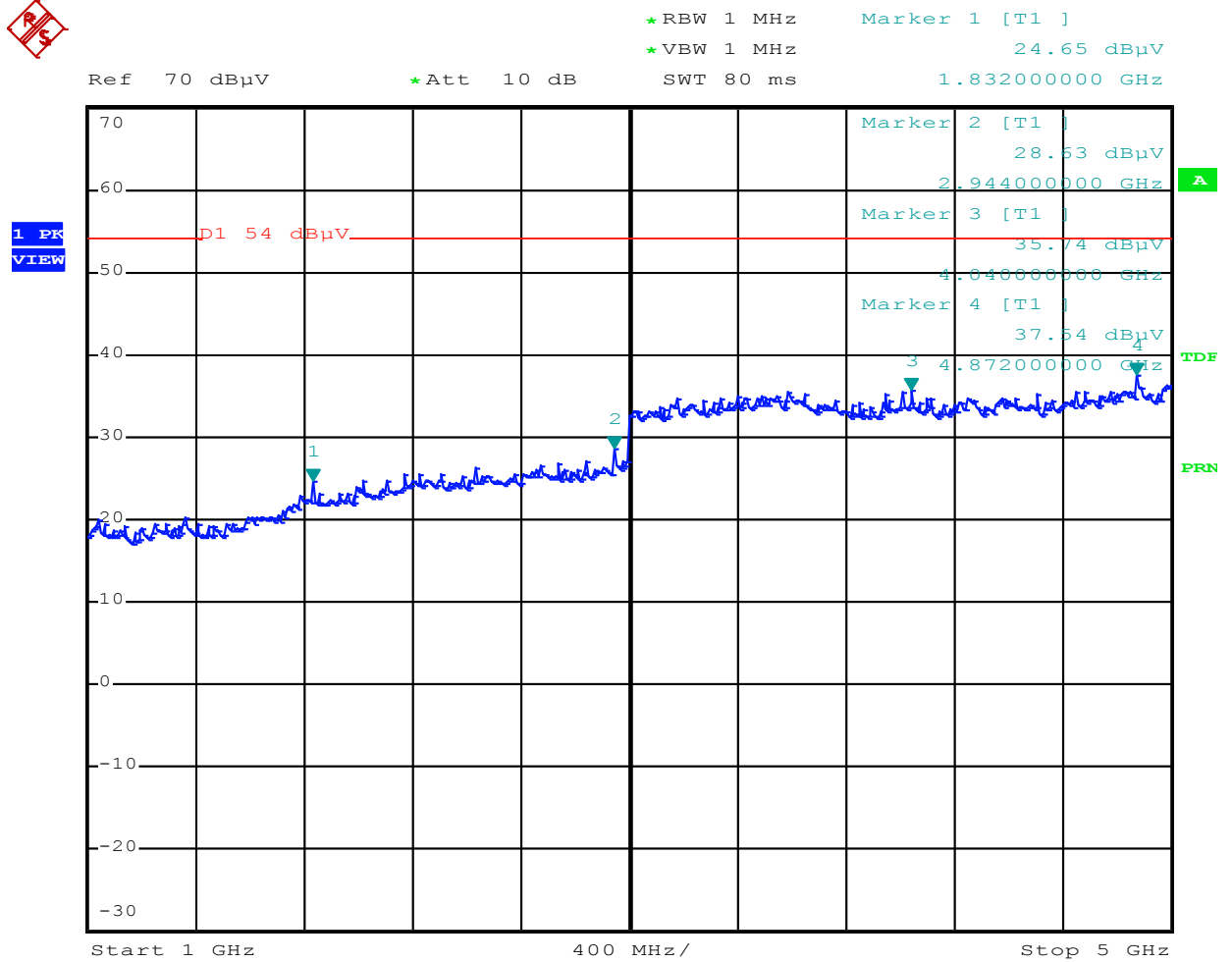
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Table 7: radiated emissions of receiver 30 MHz- 5 GHz

Freq. [MHz]	Antenna Orientation	Detector	Level [dBμV/m]	Limit [dBμV/m]	Result Pass/Fail
45.66	Vertical	Qp	35.40	40.0	Pass
162.24	Vertical	Qp	40.38	43.5	Pass
1832	Vertical	Pk	24.65	54.0	Pass
2944	Vertical	Pk	28.53	54.0	Pass
4040	Vertical	Pk	35.74	54.0	Pass
4872	Vertical	Pk	37.54	54.0	Pass

- Notes:
- tested with receive frequency set at 915.2 MHz.
 - Peak (Pk) values already within Average limits, therefor not retested with Average detector
 - Tested up to more than 3 times the maximum tunable frequency of 927.2 MHz

Figure 13: Radiated emissions of the receiver above 1 GHz



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5.1.5 Band Edge Conducted Emissions

RESULT: Pass

Date of testing: 2013-03-20

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

ANSI C63.10: 2009.

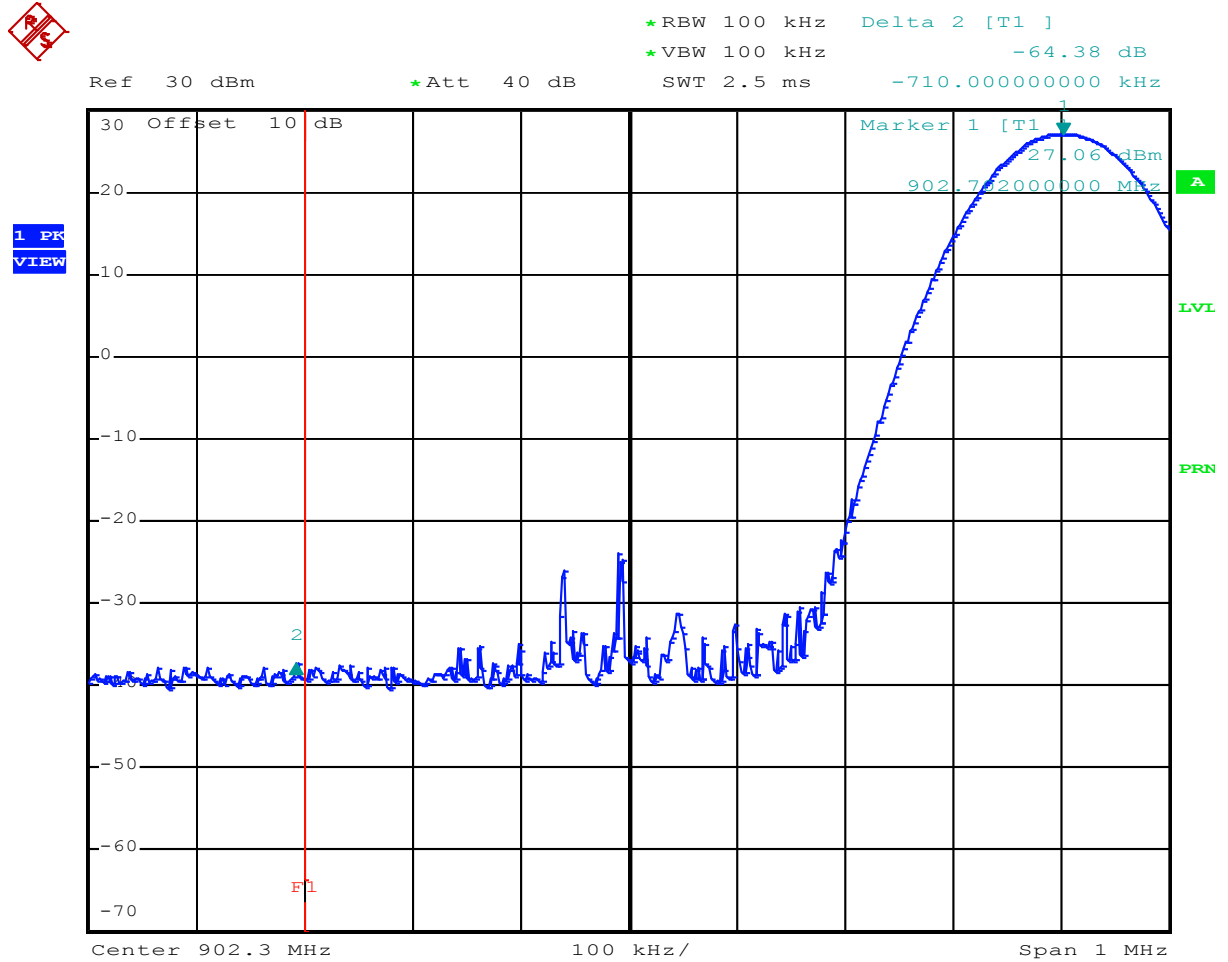
Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:

RBW = 100kHz, VBW = 100kHz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Results: All out of band spurious emissions are more than 20 dB below the fundamental. See Figures 13 and 14 on the following pages.

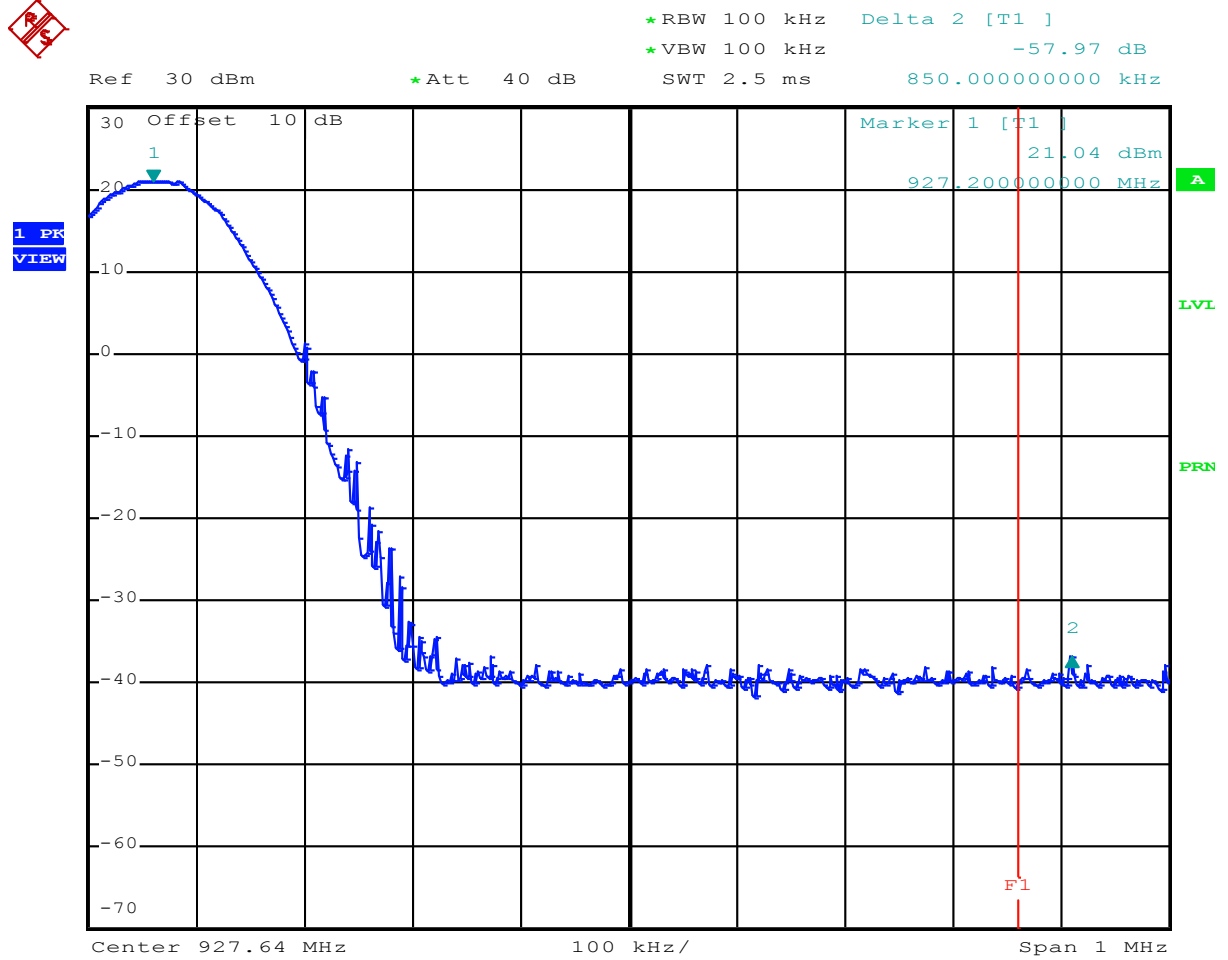
Figure 14: Band Edge Conducted Emission, Spectral Diagram, Mode 1 Hopping



Date: 20.MAR.2013 16:41:46

Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 902 MHz.

Figure 15: Band Edge Conducted Emission, Spectral Diagram, Mode 1 Hopping



Date: 20.MAR.2013 16:40:13

Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 928 MHz.

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5.1.6 Radiated Spurious Emissions of Transmitter in the restricted bands

RESULT: Pass

Date of testing: 2013-03-07

Frequency range: 30MHz - 10GHz

Requirements:

FCC 15.205, FCC 15.209 and RSS-Gen Section 7.2.2.

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen Table 3, must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen Table 5.

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a)/ RSS Gen Table 5 or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.10: 2009.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (10GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Table 8: Radiated Emission of the transmitter in restricted bands, 30MHz - 10GHz, Horizontal and Vertical Antenna Orientations, EUT Mode 1: Hopping

Freq. [MHz]	Antenna Orientation	Level Peak [dBm eirp]	Limit Average [dBm eirp] *1	Limit Peak [dBm eirp] *1	Result
1175.00	Vertical	-59.34	-41.2	-21.2	Pass
1437.00	Vertical	-59.48	-41.2	-21.2	Pass
1457.00	Horizontal	-60.65	-41.2	-21.2	Pass
2769.85	Horizontal	-53.79	-41.2	-21.2	Pass
2775.72	Horizontal	-52.98	-41.2	-21.2	Pass
2790.39	Horizontal	-52.19	-41.2	-21.2	Pass
2798.00	Horizontal	-52.14	-41.2	-21.2	Pass
4049.50	Horizontal	-49.76	-41.2	-21.2	Pass
4344.90	Horizontal	-50.11	-41.2	-21.2	Pass
7288.40	Vertical	-42.91	-41.2	-21.2	Pass
7724.60	Vertical	-43.59	-41.2	-21.2	Pass

*1: derived from the expression $EIRP_{dBm} = E_{dB\mu V/m} - 95.2_{dB}$

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is $\pm 5.0_{dB}$.
3. The EUT was tested only in vertical position- it's intended use position, the measuring antenna was varied in horizontal and vertical orientations and also around it's axis and height. The reported value is the worst case found at the reported frequency.
4. Tested with EUT in operation mode 1, it's intended use, as described in section 2.2, worst case values noted.
5. A Peak detector was used with a bandwidth of 1 MHz.
6. Peak values already within Average limits, therefor not Average not tested.

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5.2 AC Power Line Conducted Measurements

5.2.1 AC Power Line Conducted Emission of Transmitter

RESULT: Pass

Date of testing: 2013-03-27

Requirements: FCC 15.207 and RSS-Gen Section 7.2.4.

Except when the requirements applicable to a given device state otherwise, for any license-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the following table. The tighter limit applies at the frequency range boundaries.

Frequency of Emission (MHz)	Conducted Limit (dBµV) Quasi-Peak	Conducted Limit (dBµV) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

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Power supply Voltage (Vdc)	Frequency (MHz)	Measurement results (dBµV) Neutral/L2		Measurement results (dBµV) Line 1		Limits (dBµV)		Result
		QP	AV ^(note 4)	QP	AV ^(note 4)	QP	AV	
12	0.90818	33.8	--	33.8	--	56.0	46.0	PASS
12	5.54258	32.2	--	31.0	--	60.0	50.0	PASS
12	6.71066	41.6	--	41.1	--	60.0	50.0	PASS
12	11.08610	32.8	--	33.2	--	60.0	50.0	PASS
12	26.2130	33.8	--	34.2	--	60.0	50.0	PASS
12	28.8431	18.0	--	18.6	--	60.0	50.0	PASS
18	0.90818	37.5	--	37.5	--	56.0	46.0	PASS
18	6.71066	43.0	--	42.4	--	60.0	50.0	PASS
18	9.30351	30.2	--	31.1	--	60.0	50.0	PASS
18	11.08610	34.2	--	34.2	--	60.0	50.0	PASS
18	23.8226	34.2	--	34.2	--	60.0	50.0	PASS
18	26.42266	35.8	--	36.4	--	60.0	50.0	PASS
24	0.90818	36.9	--	36.2	--	56.0	46.0	PASS
24	6.71066	43.2	--	42.4	--	60.0	50.0	PASS
24	9.30351	39.4	--	39.5	--	60.0	50.0	PASS
24	11.08610	33.9	--	34.0	--	60.0	50.0	PASS
24	23.8226	34.3	--	33.0	--	60.0	50.0	PASS
24	26.4227	35.7	--	36.1	--	60.0	50.0	PASS

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207(a) and RSS-Gen Section 7.2.4, at the 120 Volts/ 60 Hz AC mains connection terminals of the power supply which was connected to the AUX3 which connects to the EUT, are depicted in the table above. The system is tested as in whole, so with all equipment as shown in Figure 1 in place and functioning. Being the worst case situation. See plots on pages 35 – 40.

Notes:

1. Tests were performed with the EUT in Mode1, it's entended use.
2. Measurement uncertainty is ±3.5dB
3. The resolution bandwidth used was 9 kHz.
4. Qp values are already within Av limits, therefor not retested on Av.

Used test equipment and ancillaries:

13313	99161	12512	15667	99852	99855	

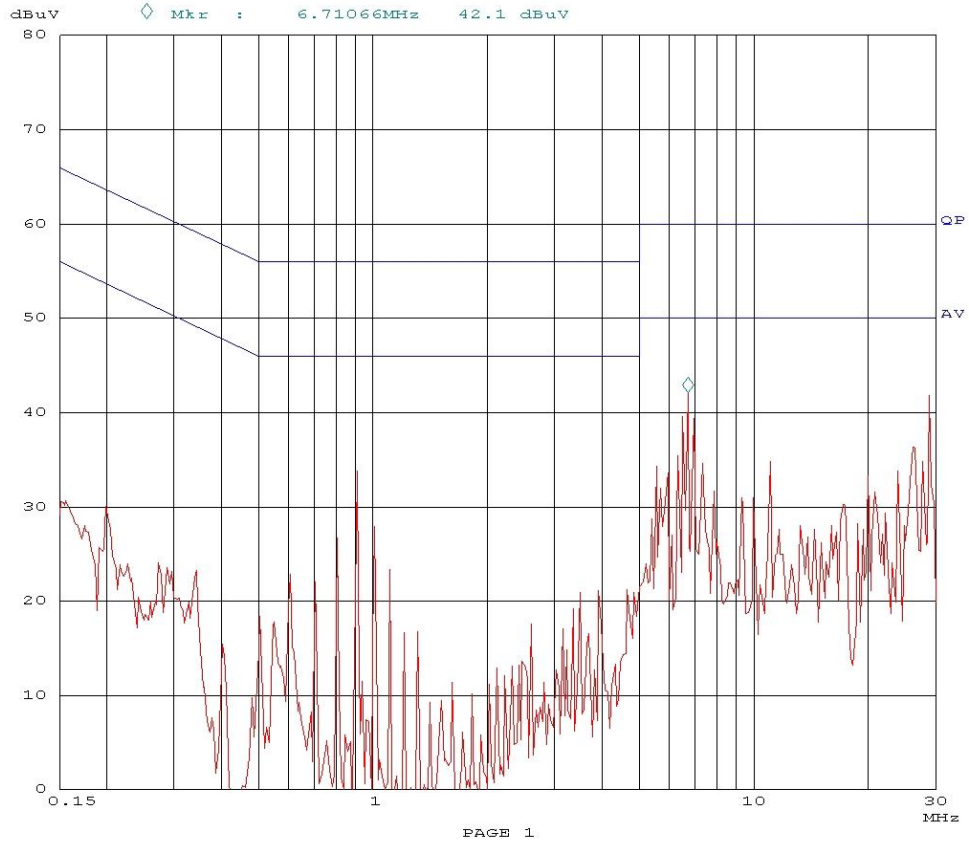
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27. Mar 13 09:09

```
Scan Settings (1 Range)
|----- Frequencies -----| |----- Receiver Settings -----|
| Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
150k        30M        0.8%      9k     EK       20ms   AUTO  LN   ON
Final Measurement: X QP
                    Meas Time: 1 s
                    Subranges: 25
                    Acc Margin: 6dB
```



Plot1 Conducted emissions on L1 – RS-485 at 12Vdc

Test Report No.:

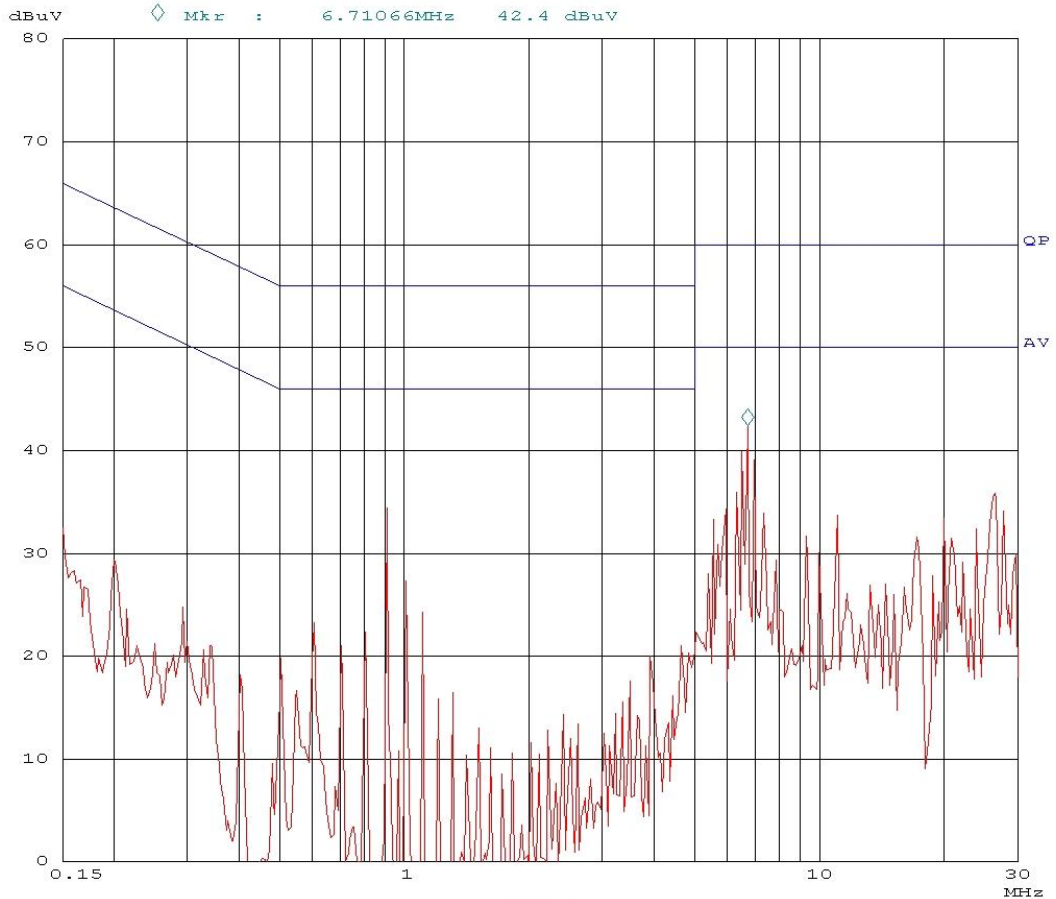
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27. Mar 13 09:21

```
Scan Settings (1 Range)
|----- Frequencies -----|----- Receiver Settings -----|
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M       0.8%     9k     PK       20ms   AUTO  LN   ON

Final Measurement: x QP
                   Meas Time: 1 s
                   Subranges: 25
                   Acc Margin: 6dB
```



Plot 2 Conducted emissions on L2 – RS-485 at 12Vdc

Test Report No.:

13022201.fcc01

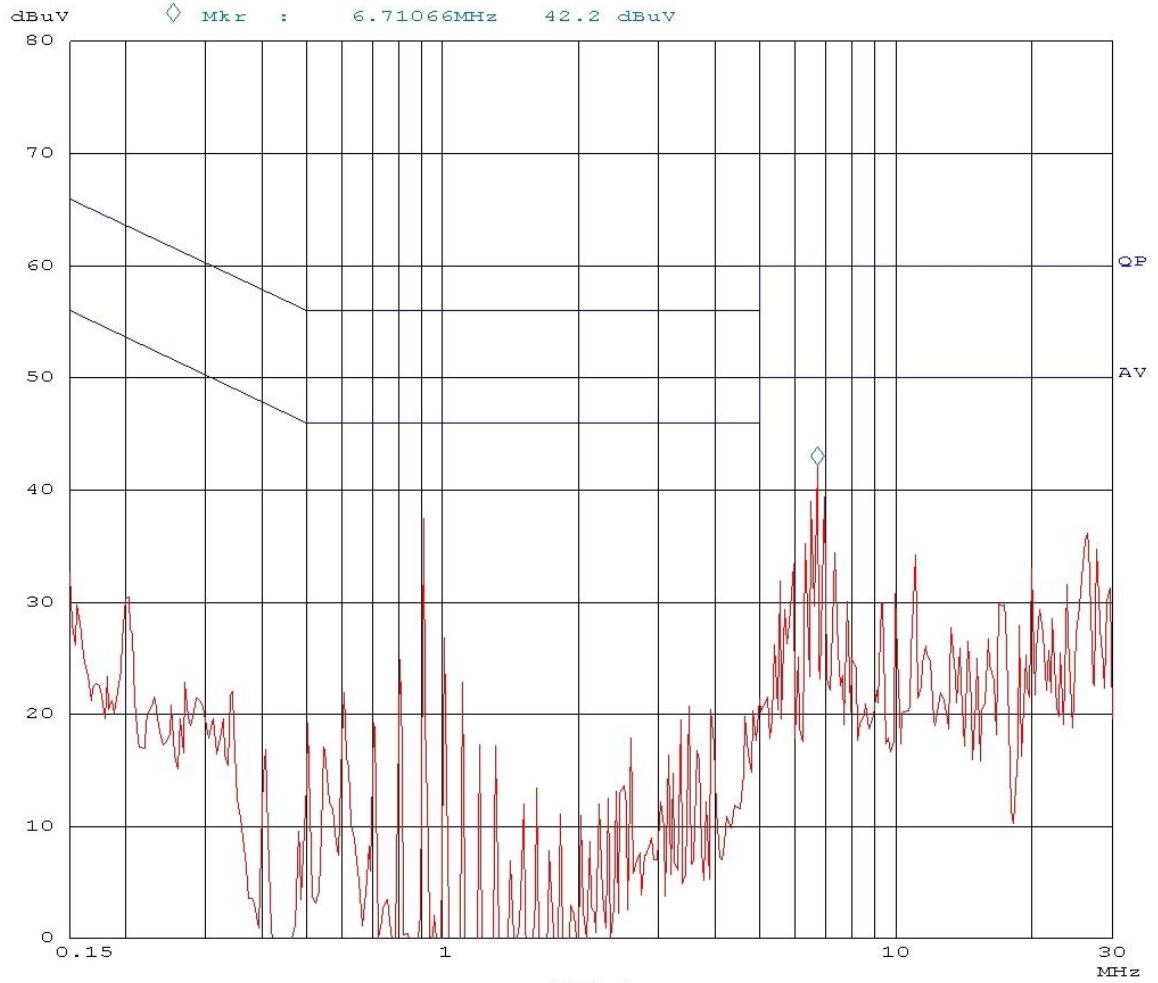
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27. Mar 13 09:30

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	
150k	30M	0.8%	9k	PK	20ms	AUTO LN	ON	

Final Measurement: x QP
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



Plot3 Conducted emissions on L1 – RS-485 at 18Vdc

Test Report No.:

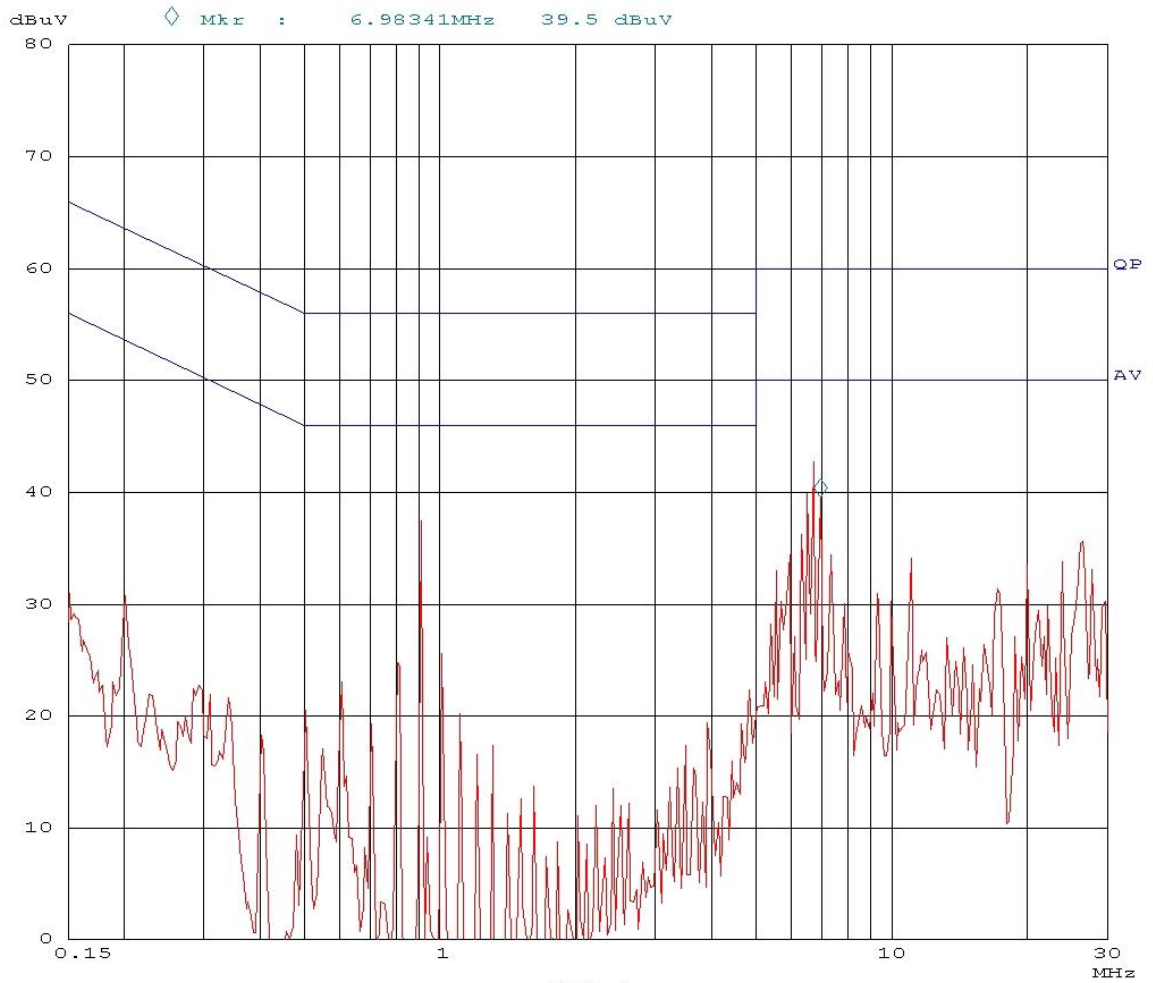
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27. Mar 13 09:24

```
Scan Settings (1 Range)
|----- Frequencies -----| |----- Receiver Settings -----|
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M       0.8%     9k     PK       20ms  AUTO  LN   ON

Final Measurement: x QP
                   Meas Time: 1 s
                   Subranges: 25
                   Acc Margin: 6dB
```



Plot 4 Conducted emissions on L2 – RS-485 at 18Vdc

Test Report No.:

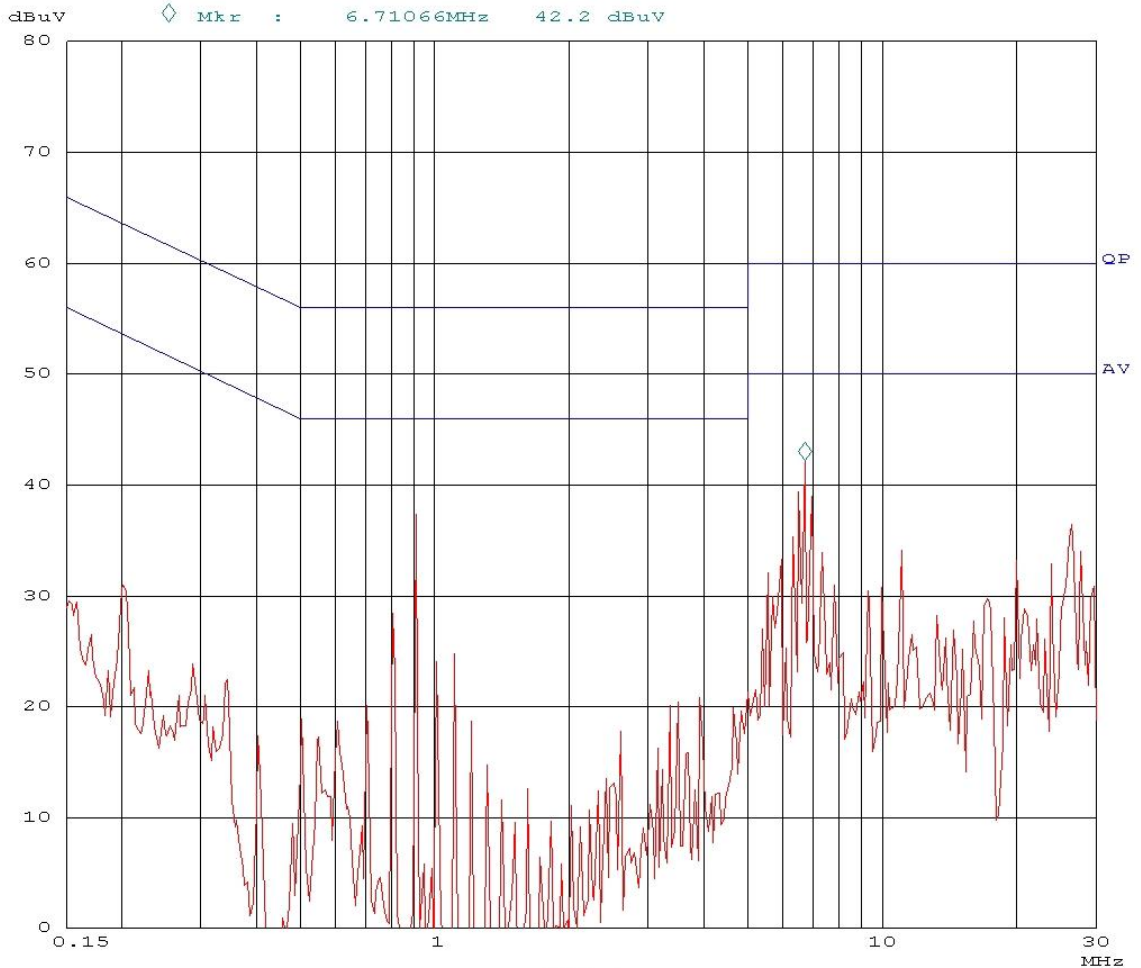
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27. Mar 13 09:33

```
Scan Settings (1 Range)
|----- Frequencies -----| |----- Receiver Settings -----|
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M       0.8%     9k     PK       20ms  AUTO LN  ON

Final Measurement: x QP
                   Meas Time:    1 s
                   Subranges:    25
                   Acc Margin:    6dB
```



Plot5 Conducted emissions on L1 – RS-485 at 24Vdc

Test Report No.:

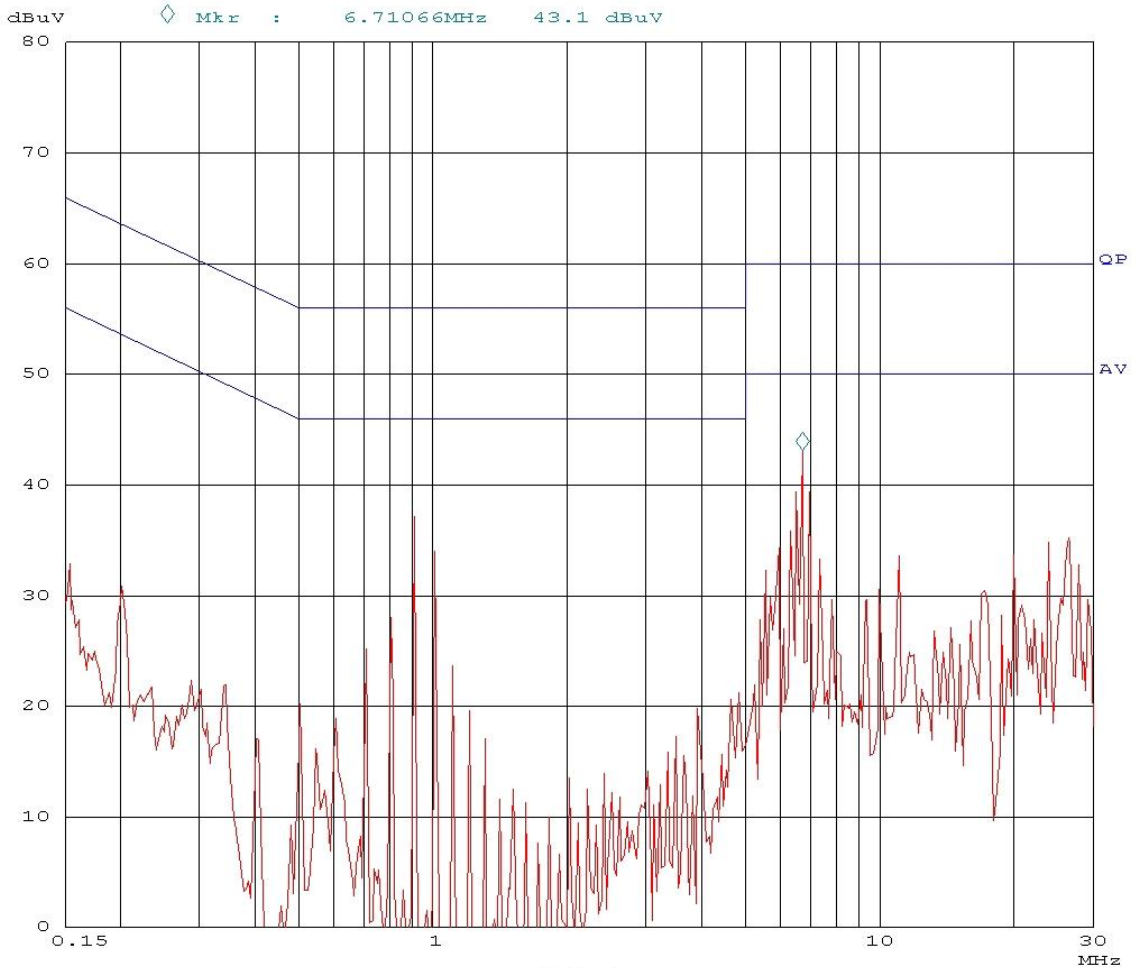
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27. Mar 13 09:41

```
Scan Settings (1 Range)
|----- Frequencies -----| |----- Receiver Settings -----|
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M        0.8%     9k     PK        20ms  AUTO  LN   ON

Final Measurement: x QP
                   Meas Time:    1 s
                   Subranges:    25
                   Acc Margin:    6dB
```



Plot 6 Conducted emissions on L2 – RS-485 at 24Vdc

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6. Number of hopping channels, Carrier frequency separation, Average time of occupancy

RESULT: Pass

Date of testing:

2013-03-13

Requirements:

FCC 15.247(a)(1)(i) and RSS-210 A8.1(c).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT.

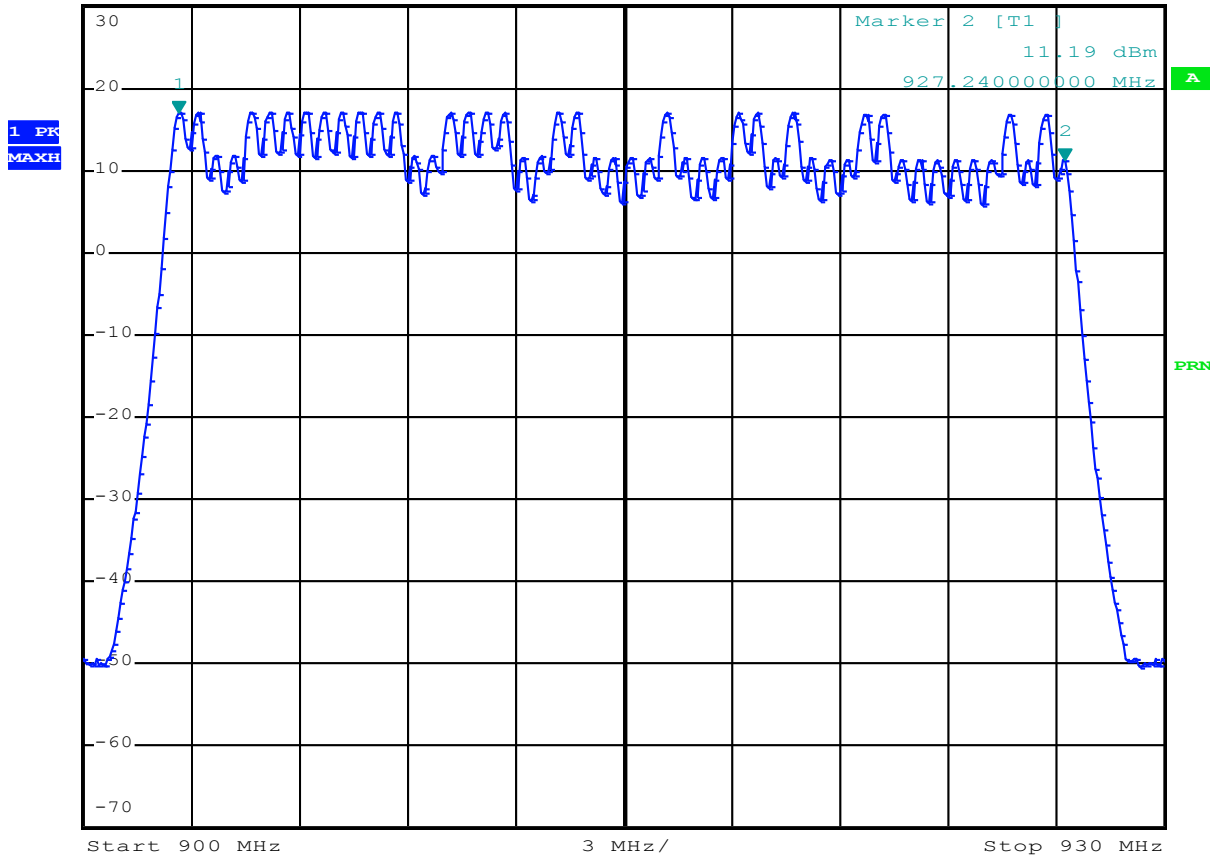
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Ref 30 dBm *Att 40 dB *RBW 300 kHz Marker 1 [T1] 17.10 dBm
*VBW 100 kHz 902.640000000 MHz
SWT 2.5 ms



Date: 20.MAR.2013 15:11:08

Plot showing 50 hopping frequencies as required by section FCC 15.247(a)(1)(i) and RSS-210 A8.1(c), as measured on a spectrum analyzer.

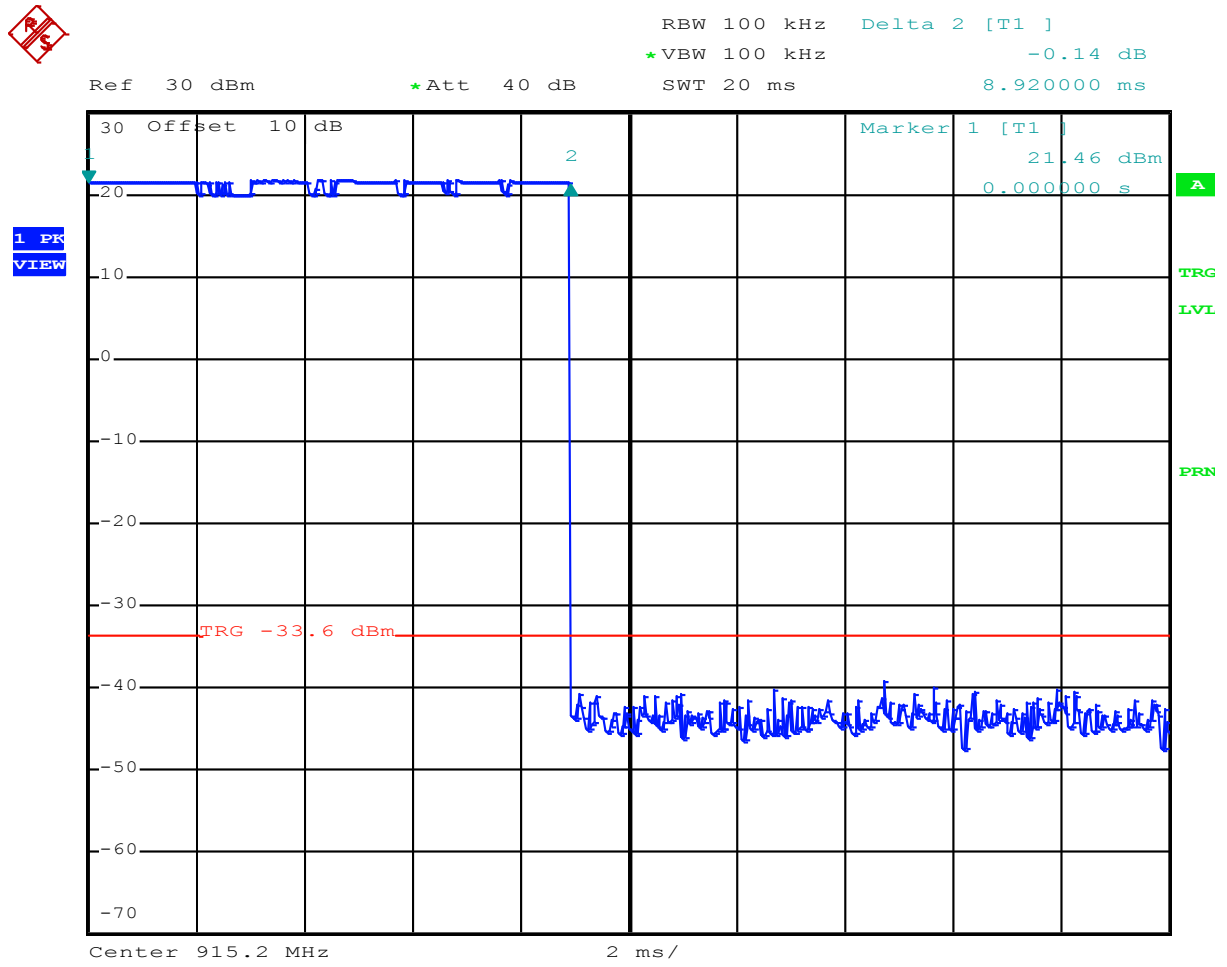
Requirement: the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have at least 50 hopping channels.

Result: **Pass**

Test Report No.:

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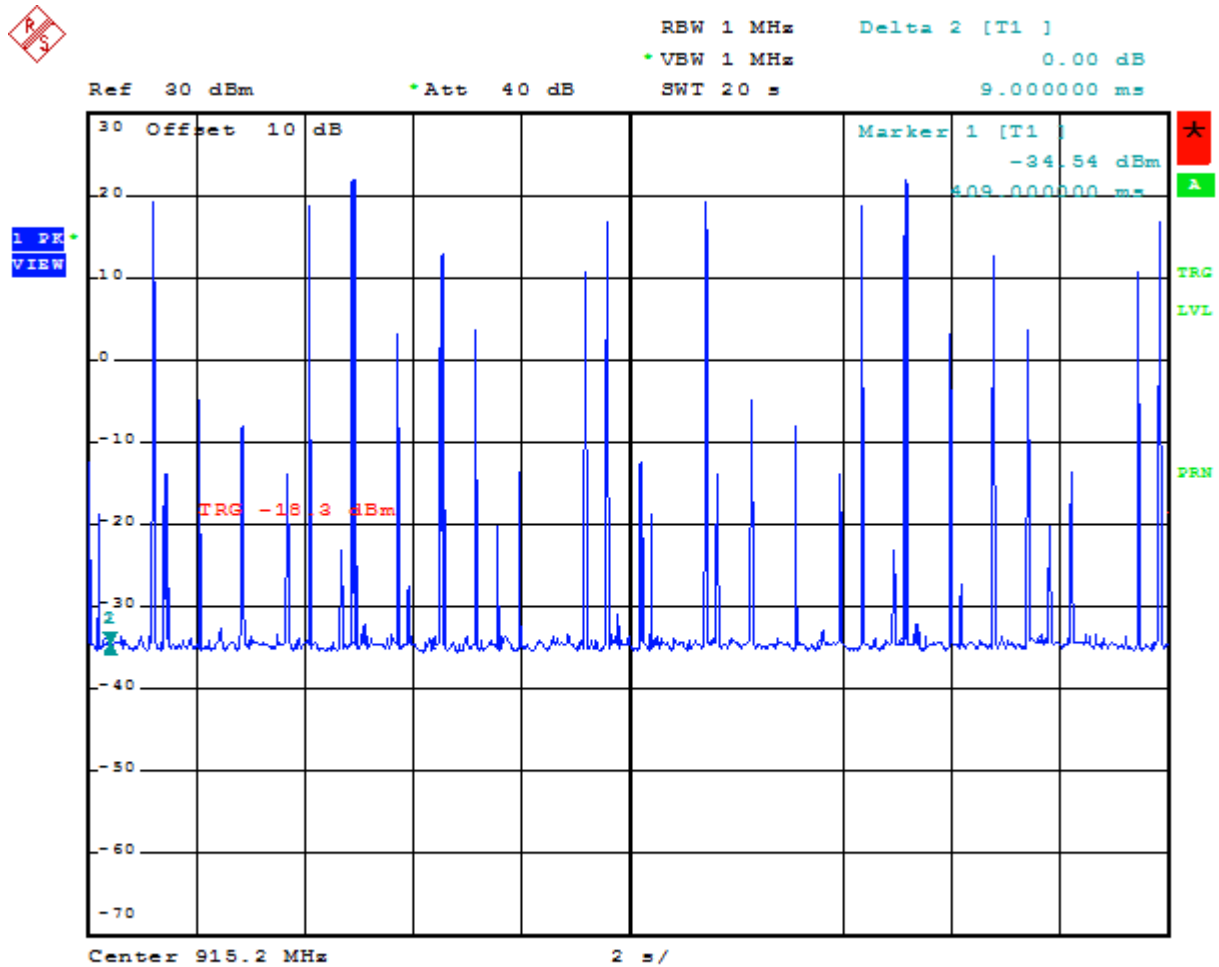
Date: 20.MAR.2013 16:35:33

Plot showing Dwell time of 1 hop (8.92ms) as measured on a spectrum analyzer.

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Date: 20.MAR.2013 16:26:31

Plot showing number hops in a 20 second period of as measured on a spectrum analyzer.
 Number of hops is 33.

Average time of occupancy = Number of hops in 20sec * dwell time 1 hop =
 $33 * 8.92\text{msec} = 294.36 \text{ msec (limit = 400msec)}$

Limit: The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have an average time of occupancy not greater than 0.4 seconds within a 20 second period.

Result: **Pass**

Test Report No.:

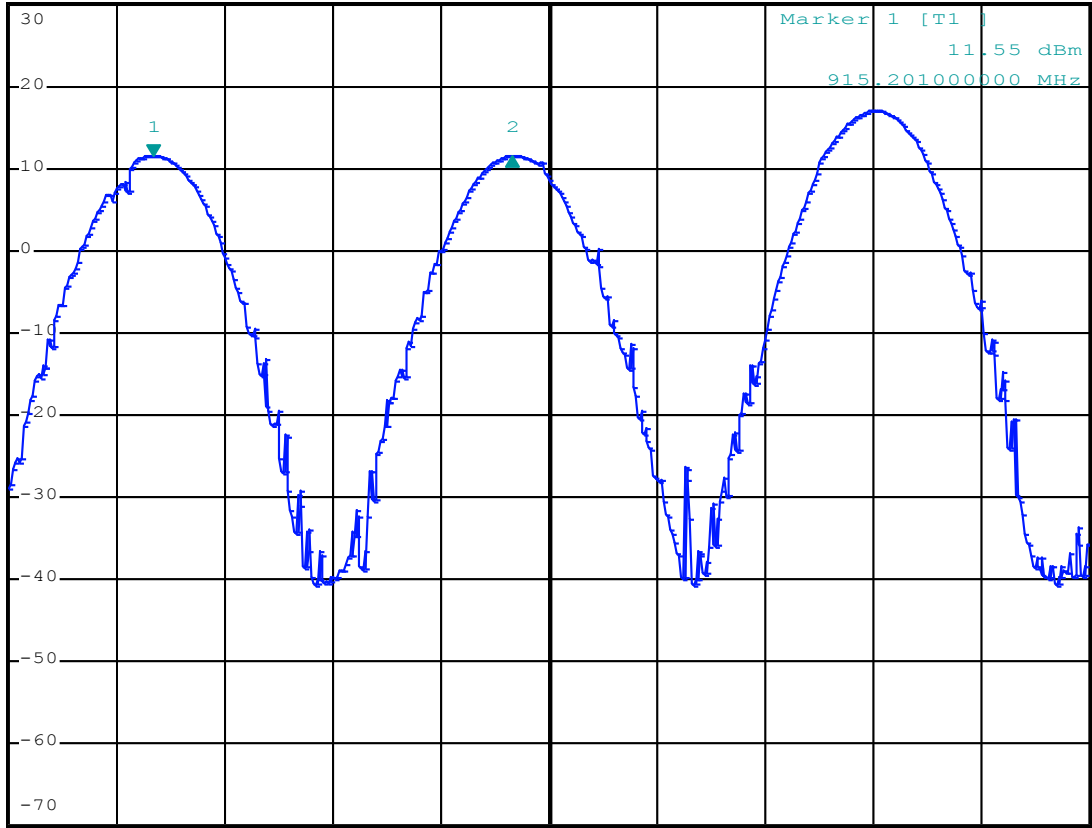
13022201.fcc01

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Ref 30 dBm *Att 40 dB *RBW 100 kHz Delta 2 [T1]
*VBW 100 kHz -0.04 dB
SWT 2.5 ms 498.000000000 kHz

1 PK
VIEW



Start 915 MHz 150 kHz/ Stop 916.5 MHz

Date: 20.MAR.2013 15:16:23

Plot : showing 498 kHz spacing between channels as measured on a spectrum analyzer.